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(54) **SHOCK PROTECTION SKIN BUMPER FOR A HARD DISK DRIVE**

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(52) **U.S. Cl.** **360/97.02**
(58) **Field of Search** 360/97.02, 97.03, 360/97.04

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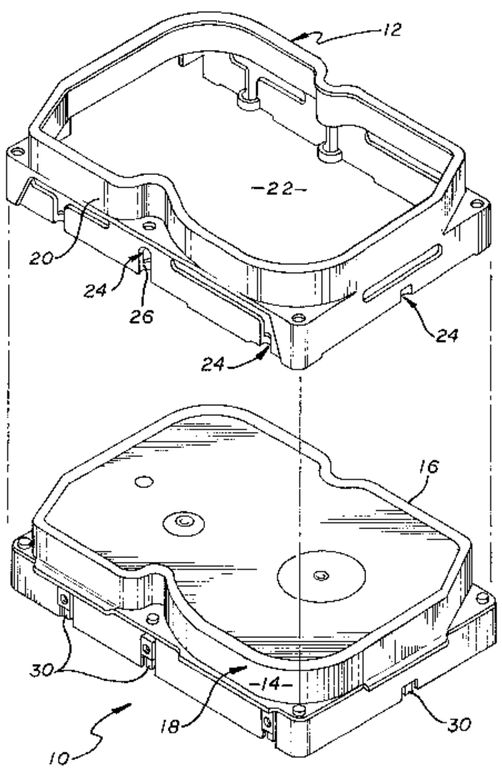
(57) **ABSTRACT**

A bumper that can be attached to an outer surface of a hard disk drive housing. The bumper may be constructed from a damping material that attenuates a shock load and dampens a resultant vibratory response of a shock event. The bumper may be snapped onto the disk drive housing without using external fasteners.

4 Claims, 3 Drawing Sheets



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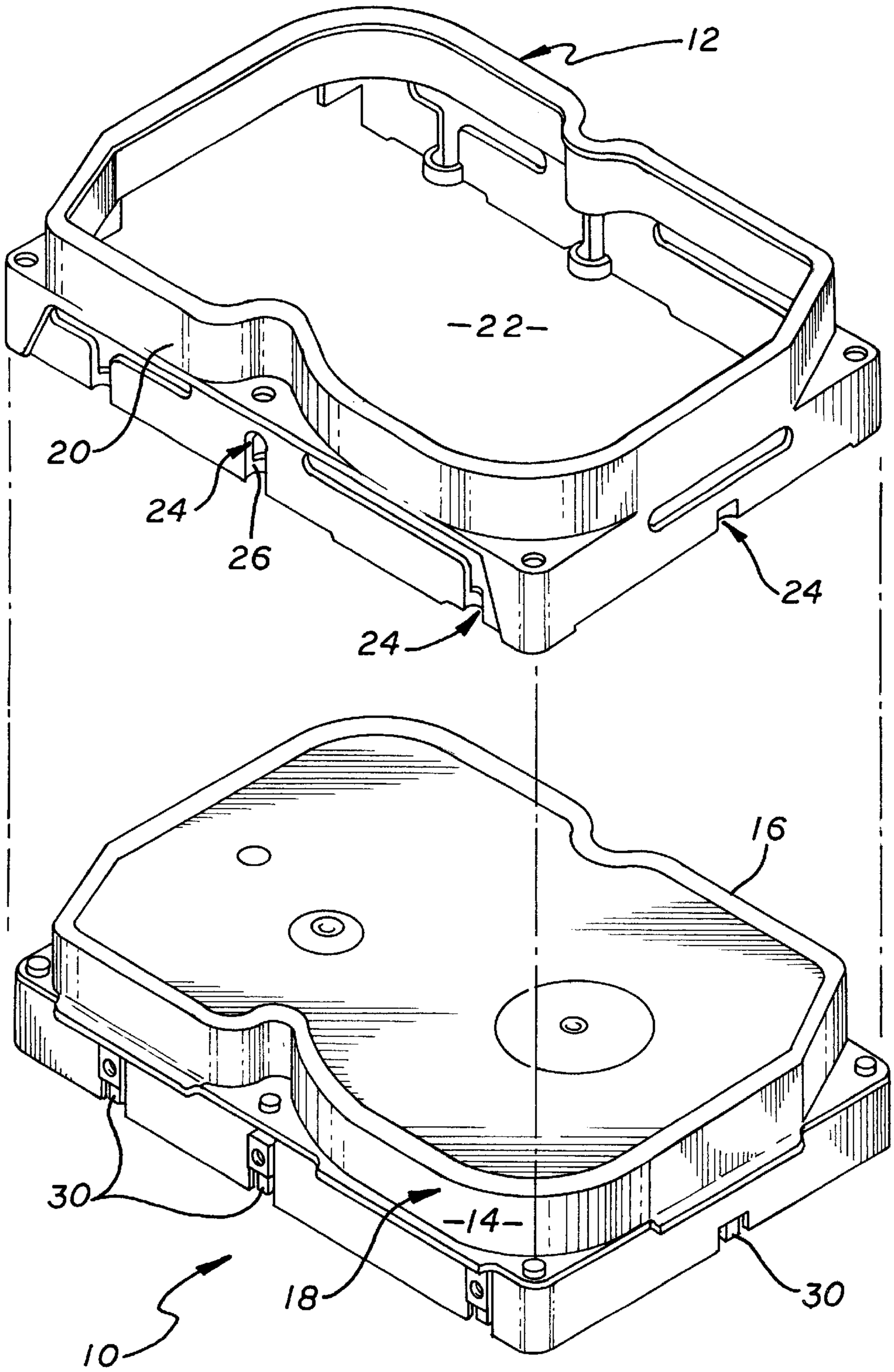

FIG. 1

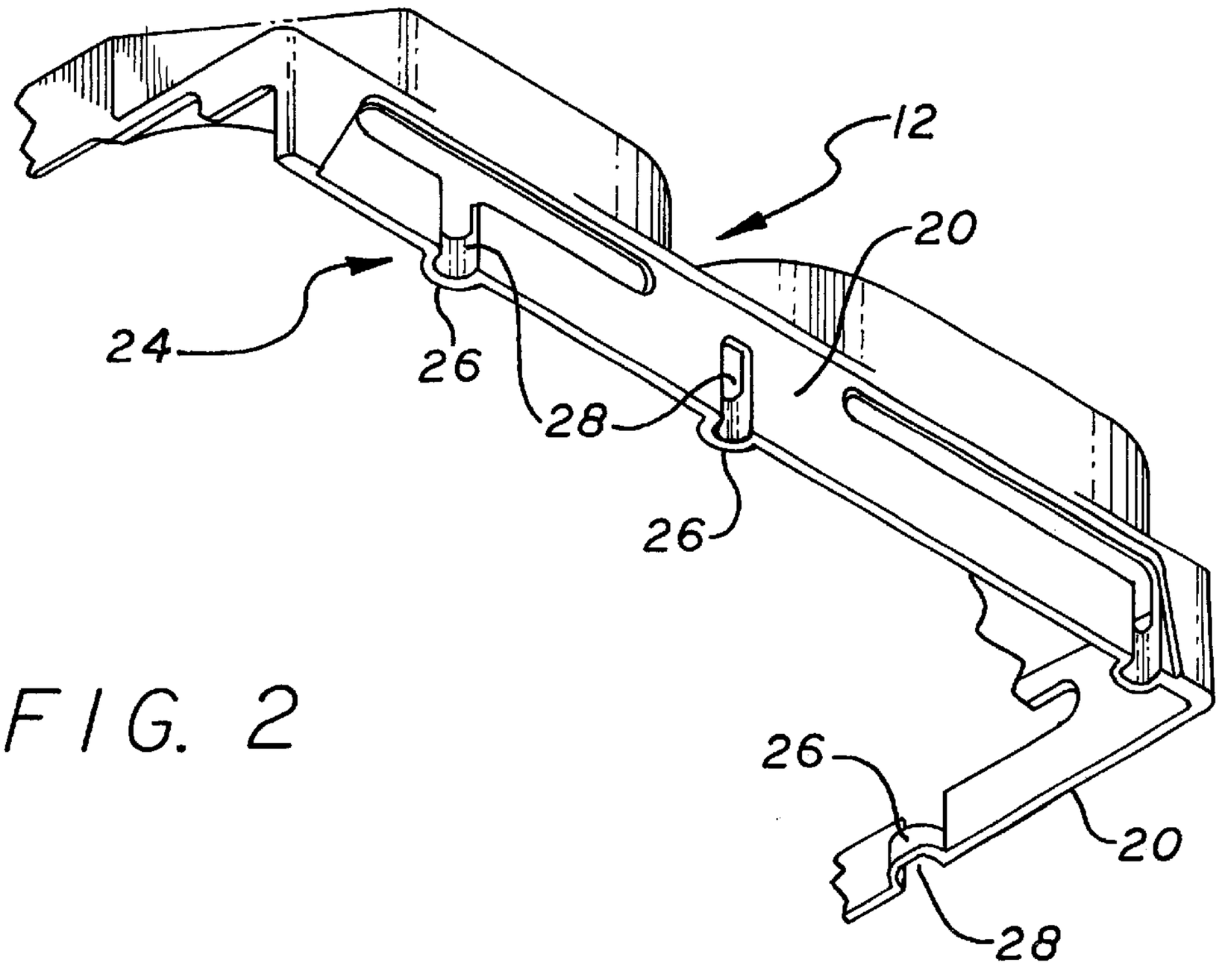

FIG. 2

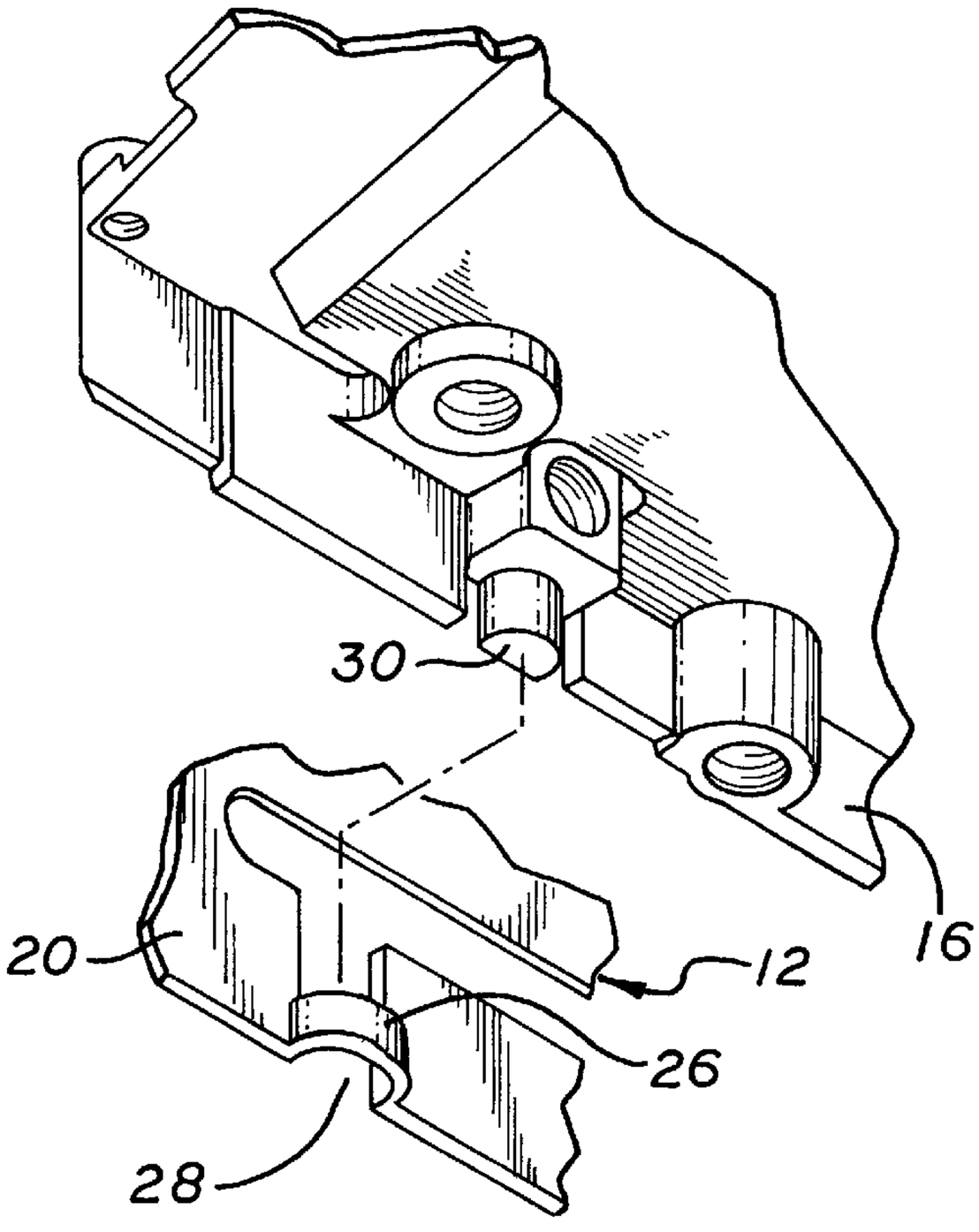

FIG. 3

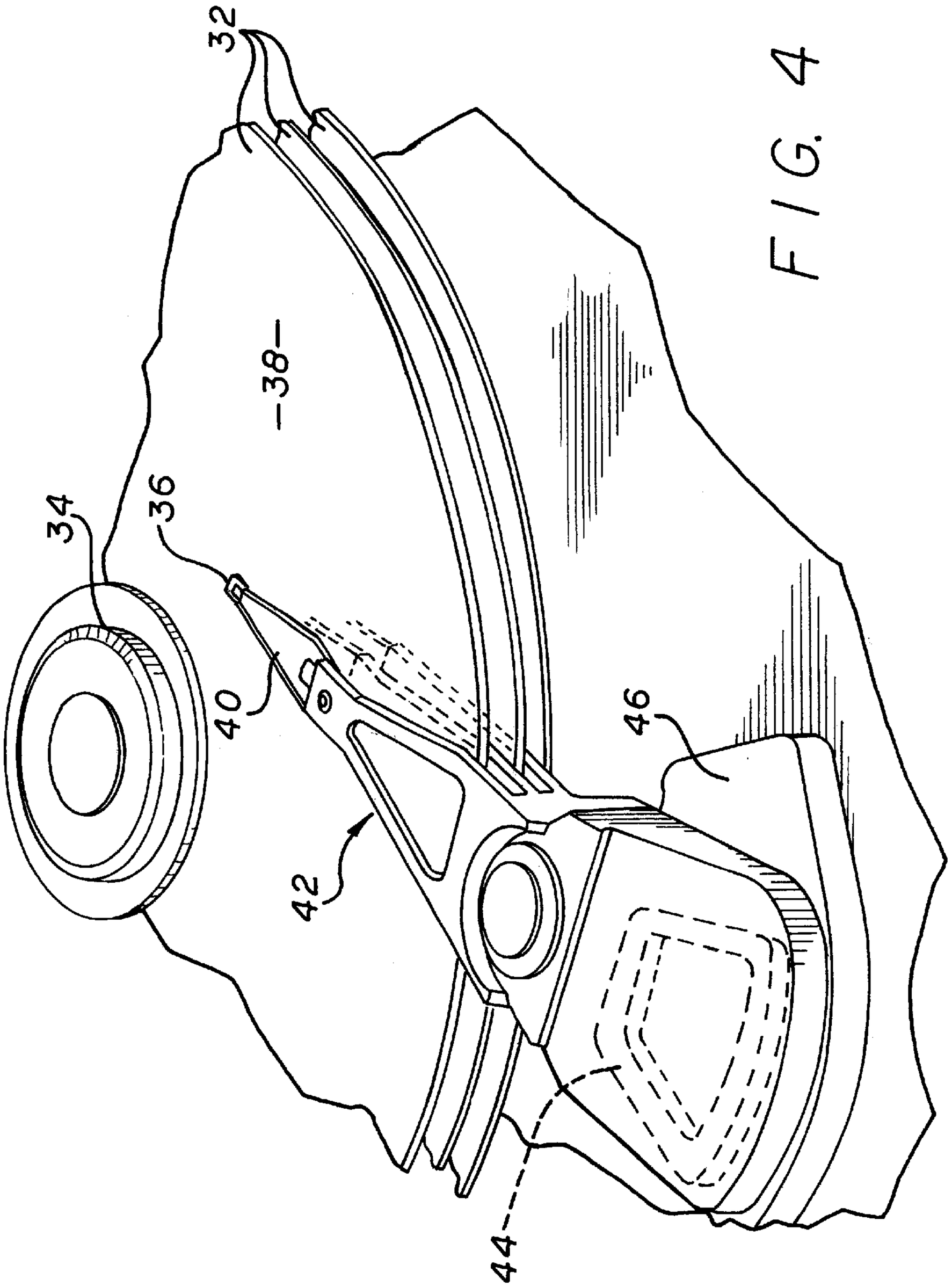

FIG. 4

SHOCK PROTECTION SKIN BUMPER FOR A HARD DISK DRIVE

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of U.S. Provisional Application No. 60/107,376, filed Nov. 6, 1998.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a bumper for a hard disk drive.

2. Background Information

A hard disk drive contains a plurality of magnetic recording heads that are coupled to a number of rotating disks. The heads can magnetize and sense the magnetic fields of the disks to write and read information as is known in the art. The recording heads are typically gimbal mounted to a corresponding suspension arm. The suspension arms are attached to an actuator arm that is pivotally mounted to a base plate of the drive. The actuator arm may have a voice coil that is coupled to a magnet assembly. The voice coil and magnet assembly are commonly referred to as a voice coil motor ("VCM"). The voice coil is connected to a circuit that can excite the VCM and induce a pivotal movement of the actuator arm. Swinging the actuator arm moves the heads across the surfaces of the disks. Data is typically located within annular tracks on the disk surfaces. Moving the heads provides access to all of the annular tracks.

Each recording head typically has an air bearing surface which cooperates with an air flow generated by the rotating disks to create an air bearing between the head and adjacent disk surface. The air bearing prevents mechanical wear between the head and the disk. The air bearing is very small to maximize the magnetic coupling between the head and the disk surface.

Hard disk drives are typically manufactured by a disk drive manufacturer and then shipped to another entity that assembles the drive into a computer system. The disk drives may be dropped or otherwise exposed to a shock event during shipping and handling. Additionally, the drives may be assembled into computers that are susceptible to shock events. The shock load may provide an impulse force which causes the disk drive to vibrate. The shock and resultant vibratory response may cause the heads to "slap" the disk or induce contact between the suspension arms and the disk surfaces. Head slapping may corrupt the data on the disk or even damage the disk drive components. It would be desirable to provide a disk drive that can dampen the shock load and resultant vibratory response of a shock event.

SUMMARY OF THE INVENTION

One embodiment of the present invention is a bumper that can be attached to an outer surface of a hard disk drive housing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded perspective view of an embodiment of a hard disk drive assembly of the present invention;

FIG. **2** is a bottom perspective view of a bumper of the hard disk drive assembly;

FIG. **3** is an enlarged bottom perspective view showing the bumper being attached to a tab of a disk drive housing; and

FIG. **4** is a top perspective view showing the internal components of the hard disk drive.

DETAILED DESCRIPTION

Referring to the drawings more particularly by reference numbers, FIG. **1** shows an embodiment of a hard disk drive assembly **10** of the present invention. The assembly **10** may include a bumper **12** that is attached to an outer surface **14** of a housing **16** of a hard disk drive **18**. The bumper **12** may be constructed from a soft damping material that can absorb shock loads and dampen vibratory energy. By way of example, the bumper **12** may be constructed from a molded polyurethane material.

The bumper **12** may have outer walls **20** that extend about an inner opening **22**. The bumper material may be flexible enough so that assembly personnel can stretch the walls **20** to snap the bumper **12** onto the outer housing surface **14**. The bumper **12** does not require fasteners to minimize the cost of assembling the disk drive **10**. The bumper **12** may have an inner profile that matches the outer profile of the housing **16**. The outer walls **20** may cover edges and other surfaces of the disk drive most likely to receive a shock load.

As shown in FIGS. **2** and **3** the bumper **12** may have a plurality of attachment features **24** that can be snapped onto the housing **16**. Each attachment feature **24** may include a radially shaped band **26** which defines a channel **28**. A corresponding tab **30** of the disk drive housing **16** can be inserted into the channel **28** to secure the bumper **12** to the housing **16**. Although a lip **26** and tab **30** are shown and described, it is to be understood that the attachment features **24** may have other configurations including molded bosses, notches, rails, and grooves, among others. In addition to, or in the alternative, the dimensions of the bumper **12** may be such that the outer walls **20** have an interference fit with the housing **16**.

As shown in FIG. **4**, the disk drive **18** may include a plurality of disks **32** that are rotated by a spindle motor **34**. The spindle motor **34** is mounted to the housing **16**. The disks **32** rotate relative to a number of recording heads **36**. There is typically a head **36** for each disk surface **38**. The heads **36** can magnetize and sense the magnetic fields of the disk surfaces **38** to write and read information as is known in the art.

Each head **36** is typically gimbal mounted to a suspension arm **40** that is attached to an actuator arm **42**. The actuator arm **42** may be pivotally mounted to the housing **16**. The actuator arm **42** may have a voice coil **44** that is coupled to a magnet assembly **46**. The voice coil **44** and magnet assembly **46** may define a voice coil motor that can be excited to swing the actuator arm **42** and move the heads **36** across the disk surfaces **38**. Data is typically stored within annular tracks that extend across the disk surfaces **38**. Rotating the actuator arm **42** allows the heads **36** to access the different tracks of data.

The disk drive may undergo a shock event which creates an initial shock force and then a resultant vibratory response. The shock event may be caused by someone dropping or bumping into the disk drive assembly **10**. The shock force and/or vibratory response may cause the heads **36** to strike the disk surfaces **38**. Additionally, the disks **32** may move into the suspension **40** and/or actuator **42** arms. If the shock load is initially applied to a disk drive surface covered by the bumper **12** the bumper material may attenuate the load. Additionally, the damping characteristics of the bumper

material may also dampen any resultant vibratory response. The bumper **12** can thus improve the shock and vibration that can be withstood by the disk drive assembly **10**, an important characteristic when producing and selling hard disk drives.

While certain exemplary embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that this invention not be limited to the specific constructions and arrangements shown and described, since various other modifications may occur to those ordinarily skilled in the art.

What is claimed is:

1. A method for attenuating a shock load and absorbing vibratory energy within a housing of a hard disk drive, comprising:

attaching a bumper to the hard disk drive housing by snapping a tab of the housing into a channel of the bumper to cover a side surface and a portion of a top surface of the hard disk drive housing.

2. A hard disk drive, comprising:

a housing which has an outer surface;

a spindle motor attached to said housing;

a disk that is rotated by said spindle motor;

a head coupled to said disk; and,

a bumper attached to said outer surface of said housing, said bumper has an attachment feature that can be snapped onto said outer surface of said housing, said attachment feature includes a band that extends from a wall of said bumper and defines a channel, said channel can receive a corresponding tab of said housing.

3. The hard disk drive of claim **2**, wherein said bumper is constructed from a rubber material.

4. The hard disk drive of claim **2**, wherein said bumper has an inner surface profile that matches a profile of said housing outer surface.

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